United States
Department of
Agriculture

Forest Service

**Northeastern
Area**

Pest Suppression, Eradication, and Related Forest Health Protection Activities

Accomplishments and Plans Fiscal Years 1994-1996

*Northeastern Area,
State and Private Forestry*

*Northeastern Area
Association of State Foresters*

*Plant Boards-
Eastern/Central*

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Pest Suppression, Eradication, and Related Forest Health Protection Activities

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Fiscal Years 1994-1996

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Introduction

This report summarizes pest suppression and eradication and related activities of the USDA Forest Service, Northeastern Area State and Private Forestry. This report provides information on the forest resource and what has and will be done in partnership with State and Federal agencies to maintain and enhance its health throughout the 20 northeastern and midwest States.

The Northeastern Area provides technical and financial assistance to State forestry and agricultural agencies to reduce the damage caused by insect and disease pests and to prevent exotic forest pests from becoming established. The Northeastern Area provides up to 50 percent of the cost of projects conducted in cooperation with other agencies. The Northeastern Area provides technical and financial assistance for similar projects on National Forests and other Federal lands, such as those managed by the Department of the Interior and Department of Defense. Projects on Federal lands are funded entirely by the Northeastern Area.

The Forest Resource

Forests cover 168.4 million acres or 41 percent of the total land area in the Northeast and Midwest. About 93 percent of this forested acreage is capable of producing wood products. The remaining 7 percent is wilderness, natural areas, urban forests, and parks.

These forests are a diverse mix of conifer and hardwood species. For reporting purposes the USDA Forest Service Forest Inventory and Analysis Units combine forest types into nine broad groups:

- ❒ white-red-jack pine
- ❒ spruce-fir
- ❒ hard pine
- ❒ oak-pine
- ❒ oak-hickory
- ❒ oak-gum-cypress
- ❒ elm-ash-cottonwood,
- ❒ maple-beech-birch
- ❒ aspen-birch.

In 1994 and 1995 forest pest suppression and eradication activities took place in several of these forest type groups and in urban forests.

❒ Oak-Hickory:

The oak-hickory forest type is the largest and most diverse forest type in the eastern U.S. It occurs from Texas north to the Dakotas eastward into New England. Within the broad type group classification known as oak-hickory, there are nine forest cover types.

These are post oak-blackjack oak, bur oak, bear oak, northern pin oak, chestnut oak, white oak-black oak-northern red oak, white oak, black oak, and northern red oak. The great range of climate, soil, and topography results in a variety of different stand conditions. White oak, northern red oak, and black oak are found throughout the type. Other common oaks on drier sites are scarlet and chestnut oak in the Appalachians; northern pin oak and bur oak in the northern and western parts of the type; and post oak and southern red oak in the west and south. Pignut hickory, mockernut hickory, shagbark hickory, and bitternut hickory are consistent but minor components of the type. Other associated species in the oak-hickory type are yellow-poplar, elms, red and sugar maples, black cherry, and on the dry sites shortleaf and Virginia pine. Understory trees and shrubs that are commonly associated with the oak-hickory type are dogwood, sassafras, serviceberry, witch-hazel, and redbud. The varied nature of the oak-hickory forests supports numerous native and some introduced insect and disease organisms. Several of the major pest problems affecting this type, such as gypsy moth, native defoliators, and oak wilt, will be discussed later in this document.

❒ Eastern Hemlock:

Eastern hemlock is part of the white-red-jack pine forest type group. Eastern hemlock occurs in pure stands, or commonly associated with eastern white pine, balsam fir, red spruce, sugar maple, American beech, yellow-poplar, and yellow birch. Eastern hemlock ranges from northern New England, west to Minnesota and south through the Appalachian Mountains. It grows best on moist well drained sites, but also grows in wet, almost swampy areas or sandy stream banks. Eastern hemlock is very shade tolerant, but does not tolerate dry conditions. Eastern hemlock has a native complement of insect and disease pests as well as one introduced pest called the hemlock woolly adelgid.

❒ Northern Hardwoods:

Northern hardwoods comprise about 29 percent of the total timberland in the Northeastern Area, making it a close second to the oak-hickory forest type group. It occurs predominantly from central Maine to northern Pennsylvania, and in the north central states from Ohio to Minnesota. The greatest concentration of northern hardwoods occurs in New York followed by Pennsylvania, Michigan and Maine. Northern hardwood forests contain sugar maple, American beech, yellow birch, red maple, although species composition can be quite variable from stand to stand. Older stands are dominated by sugar maple, American beech and yellow birch, while younger even-aged stands contain paper birch, white ash, red maple and other hardwoods. In the southern extent of the range, northern hardwoods blend with the oak-hickory forests. Northern

hardwoods are affected by a numerous insects and diseases. The most visible damage is caused by defoliators such as forest tent caterpillar.

❒ Urban Forests:

Urban forests are comprised of more than just street trees and ornamental plants. Within cities, suburbs, and surrounding towns are parks, greenways, woodlands, watersheds, vacant lots, and forested residential areas. With a few exceptions, the trees that make up urban forests are the same species that occur in the surrounding natural forests. Urban forests are subject to damage from many of the same insect and disease pests as natural forests. Urban trees are also subject to a multitude of stress-inducing phenomena that allow opportunistic insect and disease organisms to attack weakened and stressed trees—organisms that are of minor importance in the healthy forest environment. Much of this stress is attributable to human activity, such as road and housing construction, above-and below-ground utility construction, changes in soil water levels, soil drainage and compaction problems, and air and soil pollution.

In 1990, Congress recognized the importance of the urban forest and included authorization for its care by the USDA Forest Service in the 1990 Farm Bill.

Introduced Pests

❒ Gypsy Moth:

The European strain of gypsy moth, *Lymantria dispar* L., is a major defoliating pest of the oak-hickory forest type group. About 311 million acres of forest land and countless urban and and rural forested areas in the United States are believed to be susceptible to gypsy moth infestation and subsequent damage.

In 1996 about one-third of the susceptible hardwood forests, primarily the oak-hickory forest type group, in the eastern United States is infested by the gypsy moth. This area, referred to as the generally infested area, covers all or part of 16 states and the District of Columbia: Connecticut, Delaware, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia (figure 1). Gypsy moth continues to spread into uninfested areas at the rate of about 13 miles per year.

The movement of outdoor household articles from the generally infested area to uninfested areas of the country is the most common means of inadvertently spreading the gypsy moth. Historically, more than 85 percent of isolated infestations can be traced to the movement of outdoor household articles. Recently an increasing number of isolated infestations have been traced to infested nursery stock shipments.

Isolated infestations of gypsy moth have recently occurred in 20 states: Alabama, Arkansas, California, Colorado, Georgia, Idaho, Illinois, Indiana, Iowa, Kentucky, Minnesota, Missouri, Nebraska, North Carolina, Oregon, South Carolina, Tennessee, Utah, Washington, and Wisconsin. Infestations in these states have been or are in the process of being eradicated.

Introductions of the Asian strain of gypsy moth have been detected in Washington, Oregon, and North Carolina since 1992 and have been traced to shipments of military equipment from U.S. bases in Europe and commodities from Russian Far East ports. These too have been eradicated or are in the process of being eradicated. Unlike their European cousins, female moths of the Asian strain can fly, and the caterpillars eat a greater variety of trees and shrubs. Both characteristics make the Asian strain potentially more damaging than the European strain.

In the last ten years (1986-1995) defoliation by the gypsy moth in the generally infested area averaged about 2.6 million acres per year, with a high of 7.3 million acres in 1990 and a low of 0.7 million acres in 1988 (figure 2). Since 1990, defoliation has been on a steady decline throughout the generally infested area. Most of the gypsy moth activity has been located in those states most recently infested: Virginia, West Virginia, Ohio, and Michigan.

Gypsy Moth Infestation Status, 1996

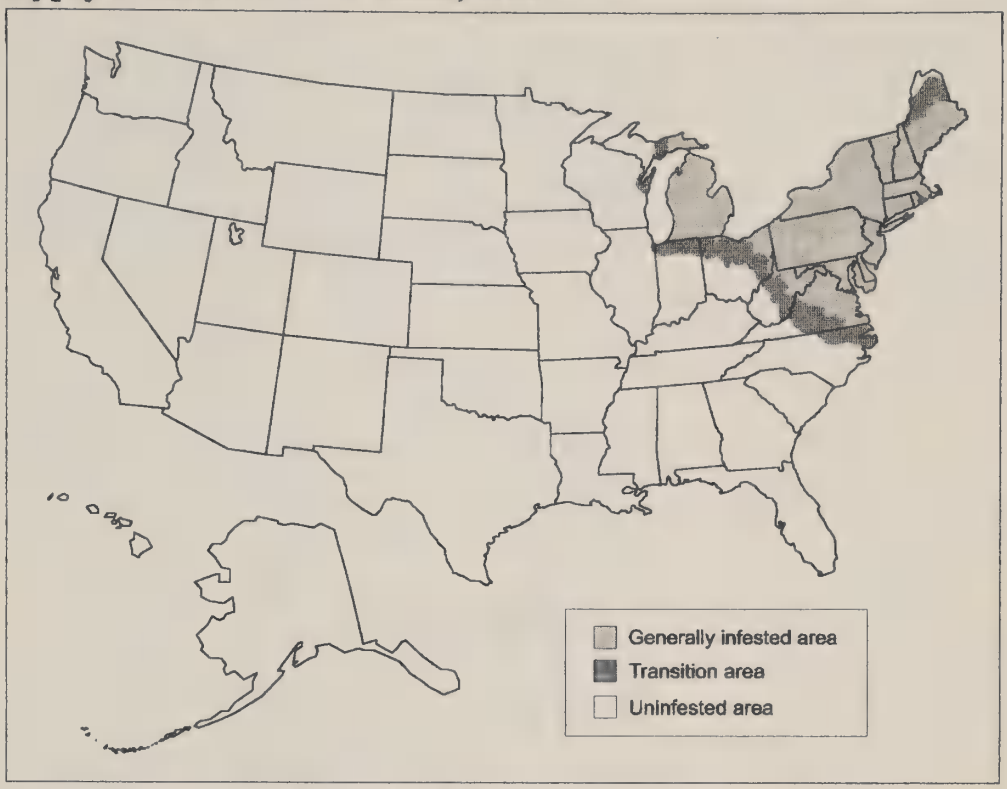

Figure 1. *Suppression of gypsy moth outbreaks is carried out in the generally infested area to reduce damage to trees. Isolated infestations that occur in the uninfested area of the country are eradicated to prevent gypsy moth from becoming established outside of the generally infested area. Under study is the effectiveness of efforts designed to slow the spread of gypsy moth into the transition area.*

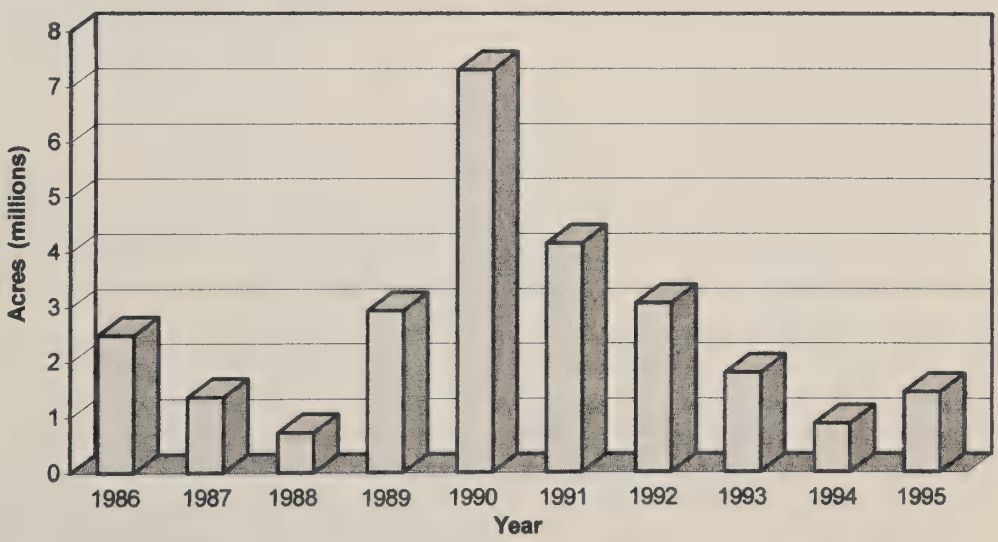

Figure 2. *Between 1986 and 1995 gypsy moth defoliated more than 26 million acres of forests and forested residential areas in the United States. The defoliation trend has been downward since 1990 when more than 7 million acres were defoliated. The gypsy moth fungus,* Entomophaga maimaiga, *is suppressing some gypsy moth outbreaks before defoliation occurs.*

❒ Hemlock Woolly Adelgid:

The hemlock woolly adelgid (HWA), *Adelges tsugae* Annand, is a pest of eastern hemlock and Carolina hemlock. It is thought to have been introduced from Asia into the western United States in 1924, but was not observed in the eastern United States until 1954, when it was associated with declining hemlocks near Richmond, Virginia. HWA is present from the Smokey Mountains, north to the mid-Hudson River Valley and southern New England.

The insect feeds during all seasons with the greatest damage occurring in the spring. By sucking sap from the young hemlock twigs, HWA retards or prevents tree growth causing the needles to discolor from deep green to grayish green, and to drop prematurely. The loss of new shoots and needles seriously impairs tree health. Defoliation and tree death can occur within several years.

HWA management is possible on individual trees. Horticultural oils, insecticidal soaps, and other insecticides are effective if excellent spray coverage of the foliage is achieved. No treatment strategies exist for hemlock forests or individual trees not accessible with ground spraying equipment. Biological control of HWA is being investigated. Research is focusing on an exotic lady bug that has shown considerable promise. It is a native of Japan where it plays an important role in maintaining low HWA populations.

In 1996 the States of Maine, New Hampshire and Vermont are enforcing state quarantines to prevent human-aided spread of HWA by excluding the import of hemlock seedlings, nursery stock, logs, and pulpwood products from States known to have HWA infestations.

Native Pests

❒ Insect Defoliators:

A number of native insect defoliators of hardwoods and conifers have been active in the eastern United States recently: the forest tent caterpillar, elm spanworm, fall cankerworm, cherry scallop shell moth, and eastern spruce budworm.

The forest tent caterpillar, *Malacosoma disstria* (Hubner), is found in association with hardwoods, and regional outbreaks occur every 6 to 16 years. The larvae feed on most broadleaf hardwood trees. In the Northeast they prefer sugar maple, aspen, and oak, but will also feed on cherry, ash, sweetgum, basswood, willow, and cottonwood. The young larvae feed on expanding leaf buds, older larvae feed on the expanded foliage. The larvae construct silken mats where they congregate when at rest or during molting periods. The forest tent caterpillar defoliated more than 600,000 acres in Maryland, New York, and Pennsylvania in 1994, and more than 490,000 acres in Maryland, Maine, Minnesota, New York, and Pennsylvania in 1995.

The elm spanworm, *Ennomos subsignarius* (Hubner), periodically causes severe defoliation in hardwood forests throughout the eastern United States and Canada. The larvae feed on the leaves of a large number of deciduous tree species, but prefer red maple, beech, ash, and all species of hickory and oak. Throughout the feeding period, larvae are found suspended from long silken strands. These serve as a means for the larvae to change feeding levels and evade danger rapidly, and may play a role in dispersal. The adult moths are white and at night are attracted to lights. More than 2 million acres were defoliated by the elm spanworm in New York and Pennsylvania in 1994.

The fall cankerworm, *Alsophila pometaria* (Harris), is widespread throughout the northeastern United States and southeastern Canada. The larvae defoliate many species of hardwoods, but seem to prefer apple and elm. During outbreaks, however, hickory, maple, ash, yellow birch, beech, basswood, boxelder, cherry, and oak may also be severely defoliated. Young larvae skeletonize new leaves while older larvae consume entire leaves, leaving only the midribs. The adult female is wingless and deposits about 100 eggs in a mass on the terminal part of a branch. Infestations are generally short-lived, lasting 2 to 3 years. During 1994 more than 175,000 acres were defoliated by the fall cankerworm in Maryland, New York, and Pennsylvania. In 1995 approximately 13,000 acres were defoliated in New York and Pennsylvania.

The cherry scallop shell moth, *Hydria prunivorata* (Ferguson), is a late season defoliator of black cherry, and occasionally other native cherries in eastern North America. The moth's name is derived from the pattern of alternating dark and light scalloped lines on the wings of the adult. The young larvae construct a tube-like nest by webbing together leaf margins, and then feed gregariously on the leaf surface within the nest. When the leaf's surface is completely stripped, the larvae move at night to other leaves where they construct a new nest and continue to feed. Attacked foliage exhibits a bright red-brown color as the remaining leaf tissue of the nest dies. Cherry scallop shell moth defoliated more than 322,000 acres in Michigan, New York, Pennsylvania, Wisconsin, and West Virginia during 1994 and almost 925,000 acres in Michigan, New Hampshire, New York, Ohio, Pennsylvania, and West Virginia in 1995.

The eastern spruce budworm, *Choristoneura fumiferana* (Clemens), prefers Balsam fir, but will defoliate white, black, and red spruce, larches, pines, and eastern hemlock. The distribution of eastern spruce budworm is restricted to the northern tier of states in the United States and adjacent provinces of Canada. Eastern spruce budworm is one of the most destructive insects in the northern spruce-fir forests of eastern North America. Young larvae feed by boring into the expanding staminate flower and needle buds. Later, they feed on the new foliage of

developing shoots and then on older needles. Tree mortality often takes place after three or more years of severe defoliation, depending on the general vigor of the trees. In 1994 more than 198,000 acres were defoliated in Minnesota and New York, and in 1995 more than 569,000 acres were defoliated in Michigan, Minnesota, New York, and Wisconsin.

❒ Oak Wilt:

Oak wilt, a native vascular wilt disease caused by the fungus, *Ceratocystis fagacearum* (Bretz Hunt), is a primary cause of oak mortality throughout the oak-hickory forest type group, especially in the sandy soils of the Lake States. The disease is believed to have been in the Lake States since the 1880's. Currently oak wilt can be found in 21 states and more than 600 counties in the United States. All oak species are susceptible to the disease, but species of the red oak group are the most susceptible. Once infected with the disease, red oaks die in a few weeks. Members of the white oak group may survive for many years.

The oak wilt fungus is spread from diseased to healthy trees in two ways. Short-distance spread occurs primarily through root grafts between diseased and healthy trees. Long-distance spread occurs when sap-feeding beetles carry fungal spores from diseased to healthy trees. Such insects are attracted to fresh wounds, often caused by logging damage or pruning. This type of spread is most effective in spring when wounded trees are most susceptible. Transmission through root grafts is more common and prevalent in deep sandy soils than in heavy clay or rocky soils.

Oak wilt caused tree mortality can be minimized by severing the roots between healthy and diseased trees with a vibratory plow. This technique in addition to timely removal of diseased trees that have spore pads, can be more than 90 percent effective in controlling the spread of oak wilt.

Gypsy Moth Suppression and Eradication

In 1994 gypsy moth suppression and eradication projects were conducted by eight Northeastern Area states, three National Forests, one Tribal government (Seneca Nation), and two other Federal sites totalling more than 544,000 acres (tables 1 and 3). This is slightly more than the area treated the previous year. The primary treatments applied were *B.t.k.* (about 64 percent), diflubenzuron (about 35 percent), and gypsy moth virus (about 1 percent). Forested residential areas accounted for about two-thirds of the area treated, with recreation areas and forests accounting for the remainder. Total treatment costs were approximately $12.8 million with the Forest Service contributing almost half the cost.

In 1995 suppression and eradication projects were conducted by eight states, the Monongahela National Forest in West Virginia, one Tribal government (Seneca Nation), and four other federal agencies in the Departments of Defense, Interior and Agriculture (tables 4 and 6). Treatments totalled about 306,000 acres or nearly 50 percent less than was treated in 1994. Treatments included use of *B.t.k.* (about 73 percent), diflubenzuron (about 27 percent), and gypsy moth virus (less than 1 percent). As in 1994 the majority of acreage treated was in forested residential areas.

Most projects occur in urban forest areas with high value forested parks and recreation areas, forested residential communities, and a small amount of high value commercial forest stands. Much of a gypsy moth outbreak area in a state is not treated. Therefore gypsy moth populations in untreated areas are influenced by natural control agents—both environmental (weather, for example) and biological (parasites, predators, and pathogens). The fungal pathogen *Entomophaga maimaiga*, in particular, may have been a major contributor to the decline of gypsy moth outbreaks in 1994 and 1995.

Gypsy moth caused tree defoliation continued in a downward trend in 1994, totalling about 877,000 acres or less than half the acres defoliated the previous year. Defoliation rebounded to 1.4 million acres in 1995, although this was still far below the most recent record high of 7.3 million acres defoliated in 1990 (figure 2).

Oak Wilt Control

Oak mortality has been heavy on sandy loam sites in Minnesota for many years. In 1988 a photographic survey identified more than 3,000 oak wilt infection centers encompassing almost 100,000 trees in the Minneapolis, St. Paul metropolitan area. Oak mortality has accelerated dramatically with the expansion of housing developments into many of the high risk forest areas. Housing construction and related activities

damage oak trees and create numerous oak wilt infection centers. The centers expand at a rapid rate, eventually killing all of the remaining oak trees throughout the residential developments.

Since a cooperative oak wilt control project with Minnesota was started in 1992, about 2545 infection centers have been treated, almost a million feet of plow-line installed, and 8204 spore-producing trees removed. More than half of these accomplishments were achieved in 1994 and 1995 (tables 2 and 5). One hundred twenty-five communities in seven counties have been involved and 46 grants have transferred Federal and State dollars directly to oak wilt programs in the counties. In 1994 and 1995 more than $2 million was spent on oak wilt control projects. About half that cost ($994,000) was provided by the Northeastern Area. It is estimated that about 1 million trees on about 10,000 acres have been protected from infection.

One valuable and important spinoff of the control project is the extensive public information and education efforts by the State. The Minnesota State Department of Agriculture has one full-time position devoted to public information and education efforts regarding oak wilt. The University of Minnesota also includes oak wilt in their extension outreach effort. Many of the communities involved with the problem have regulations that builders have to abide by to preserve trees and minimize the impact of oak wilt.

An oak wilt control project was also conducted at Fort McCoy in Wisconsin in 1995 (table 6). A total of 288 infection centers on about 9,071 acres were treated.

Native Defoliators

In 1994 the Allegheny National Forest in Pennsylvania treated 55,762 acres and the nearby Seneca Indian Nation treated 1,388 acres to protect forest resources from damage caused by elm spanworm (table 3). That same year the Commonwealth of Pennsylvania, at their own expense, treated 34,782 acres of public land also for elm spanworm. The insecticide *B.t.k.* was used in all of these projects.

While elm spanworm populations declined in 1995, populations of other native defoliators, such as forest tent caterpillar, fall cankerworm and eastern spruce budworm, increased. That year the Allegheny National Forest used the insecticide *B.t.k.* to protect 55,444 acres from defoliation by the forest tent caterpillar. In cooperation with the Allegheny National Forest, the Seneca Indian Nation treated 2353 acres with *B.t.k.* to prevent damage to forest resources from forest tent caterpillar and fall cankerworm (table 6). The Northeastern Area cooperated with the Commonwealth of Pennsylvania in treating 28,353 acres of State forests and parks with *B.t.k.* to prevent damage from forest tent caterpillar and fall cankerworm outbreaks (table 5).

Also in 1995 the Grand Portage Indian Reservation Tribal Government (Minnesota) used *B.t.k.* on 178 acres to prevent damage to forest resources from eastern spruce budworm (table 6).

Hemlock Woolly Adelgid

Monitoring plots established in New Jersey, Pennsylvania, and West Virginia are increasing our database about impacts of the hemlock woolly adelgid. A coordinating committee and working group were established and a working group meeting was held. A strategic plan was created to identify research needed and current activities. The National Center for Forest Health Management provided support through cooperative agreements to intensify research on population dynamics and biological control. The Technology Development Program provided support for continued chemical control evaluations to protect high value trees. Forest Service Research began to investigate HWA feeding at the cellular level. The Delaware Water Gap National Recreation Area treated infested hemlocks in 1995 (table 6).

National Gypsy Moth Environmental Impact Statement

Assessments of the human health and ecological risks of the treatments that could be used in USDA gypsy moth projects—*B.t.k.*, diflubenzuron, gypsy moth virus, mass trapping, mating disruption, and sterile insect technique—were completed in 1994. A draft environmental impact statement (EIS) was published and made available on May 12, 1995 for a 60 day public comment period. The final EIS was completed in the fall, and the Notice of Availability was announced in the *Federal Register* on December 4, 1995. More than 3,000 copies of the five volume final EIS were mailed to individuals and organizations, including international addresses. The preferred alternative identified in the final EIS was to implement a national program consisting of suppression, eradication and slow the spread strategies.

The EIS describes how the USDA Forest Service and Animal and Plant Health Inspection Service will cooperate with others to manage gypsy moth in the United States.

Gypsy Moth Slow the Spread Pilot Project

The objective of the Slow the Spread (STS) pilot project is to demonstrate the feasibility of using integrated pest management strategies over wide geographic areas to reduce the rate at which gypsy moth is spreading. Project areas were selected in 1992 in North Carolina, Virginia, and West Virginia, and in the Upper Peninsula of Michigan in 1993. Monitoring information gathered from an intensive array of gypsy moth pheromone traps deployed in the project areas is used to decide where treatments are necessary and to measure how the treatments are affecting the rate of

spread. Treatments were applied to 30,759 acres in 1994, and to 35,238 acres of State and private land in North Carolina, Virginia, and West Virginia, and the Jefferson National Forest in Virginia in 1995. These treatments included application of *B.t.k.*, diflubenzuron, gypsy moth virus (Gypchek), and pheromone flakes (mating disruption).

From the results achieved so far in the pilot project, it is estimated that the rate of spread of gypsy moth could be reduced by 35 to 40 percent if STS were implemented throughout the transition area (figure 1).

Project Safety

"Safety is the discipline to always do things correctly" is the watchword of gypsy moth suppression and eradication projects coined to define safety in the context of project management. The application of lessons learned in previously completed aviation management and safety courses and site visits was reviewed in the field during the 1994 and 1995 seasons. This information was reported in trip reports, newsletters, and in presentations to annual gypsy moth program reviews. The use of standardized off-the-shelf aviation management and safety courses supplemented by specific needs has been validated. This is especially true for S-270 Basic Aviation Operations and a modified approach to I-220 Basic Incident Command System. Based on a series of intensive 8-hour Radio Communications Seminars, the use of radios from the National Interagency Radio System Cache (NIRSC) is well established with several Northeastern Area cooperators.

Differentially Corrected Global Positioning Satellite Systems

Differentially corrected global positioning satellite (DGPS) systems were first used in gypsy moth projects for locating spray blocks and positioning aircraft during application in 1994. In fall 1994, formal field tests were conducted by the Forest Service Technology and Development Center (Missoula, MT) in cooperation with the Northeastern Area and the Southern Region (Region 8). Area and Regional Forest Health Protection specialists subsequently developed technical specifications for DGPS which cooperators could use in their contracts for aerial spraying services in 1995.

DGPS systems were in much greater use during 1995 projects which served to further refine the implementation of DGPS technology as a planning and mapping tool with enhanced record storage capabilities. The experience and knowledge gained by users during 1994 spray projects provided a firm basis upon which to improve the accuracy of identifying spray blocks and analyzing spray coverage. This enhanced the cost-effectiveness of gypsy moth suppression and eradication projects. Developers of DGPS hardware and software are marketing more sophisticated products allowing easier programming, greater file

storage space, and higher resolution plotting. The by-product of these enhancements allows project managers to conduct aerial applications in a safer manner providing more accurate navigational systems and greater capability to evaluate aircraft position in spray blocks during treatment.

Decision Support System for Gypsy Moth Management

The use of computer technology to assist in gypsy moth management is the focus of a new product rolling off the technology production line at the Northeastern Area's Morgantown Field Office (MFO) in Morgantown, West Virginia. GypsES is a computer based decision support system which has been under development for several years as a joint effort between the Northeastern Area, the Northeastern Forest Experiment Station and the Forest Service's Southern Region. GypsES provides users with a toolbox of computer-based assistance including a geographical information system framework, rulebases, and models to predict defoliation, hazard, risk, tree mortality, and spray deposit. Users of GypsES in 1994 and 1995 included the Virginia Department of Agriculture and Consumer Services, North Carolina Department of Agriculture, Prince William County (Virginia), the Arkansas Plant Board, and the Tennessee Division of Forestry.

Gypsy Moth Digest

A database of gypsy moth defoliation, suppression, and eradication acres has been created. The Gypsy Moth Digest, maintained by the Forest Health Protection staff in the Northeastern Area's Morgantown Field Office in West Virginia, contains historical and current data by State and year. The cost, both Federal and State contributions, of conducting suppression and eradication projects is also included. Partial information from the database can be now be accessed via the world wide web. More detailed information can be obtained by contacting the Morgantown Field Office. The web site can be found at ***http://www.fsl.wvnet.edu/fhp/gm_digest/gmdigest.html***.

Gypsy Moth Home Page

Information about the gypsy moth and its management can now be accessed via the world wide web. The Northeastern Area and the Northeastern Forest Experiment Station have established a Home Page for direct access to the following: research projects and results; a database of gypsy moth defoliation, suppression, and eradicaton acres; the Gypsy Moth News newsletter; information about the Slow the Spread Pilot Project; and an email discussion group. The Home Page can be found at ***http://www.fsl.wvnet.edu/gmoth***.

National Pest Suppression Tracking System

In 1994 and 1995 Forest Health Protection at the Northeastern Area's Morgantown Field Office in West Virginia again operated the national pest suppression tracking system (NPSTS) at the request of the Washington Office. NPSTS is a computerized system for tracking pest management projects. All forest pest suppression and eradication projects in which the Forest Service participates are tracked on a daily basis to provide up-to-the minute data and briefings of project status throughout the United States. Daily reports of project completion, and accidents or incidents are available to anyone needing that information. In the six years that the system has been operated and maintained it has become indispensable to Forest Service management.

Treatment Monitoring Program

According to established Forest Service guidelines posttreatment evaluation of pest suppression projects is necessary to document results and other pertinent information derived from the projects. The Treatment Monitoring Program establishes procedures for quantifying the success of gypsy moth suppression projects.

In 1995, the success of State and Federal gypsy moth suppression projects was evaluated based on stated objectives identified in their environmental assessments. A draft report of the treatment monitoring results was sent to each State and Federal agency for review. The draft identified the project objectives that were outlined in the project environmental assessment and how well they met those objectives (percentage of acres successfully treated). As part of the posttreatment evaluation, a meeting or telephone conference was held to discuss the findings given in the report and recommend program improvement. These results and recommendations were documented in a final report.

Monitoring project success is important. In addition, combining this information over several years will tell us how successful gypsy moth projects are overall, and will identify trends which will be used to improve all projects.

Gypsy Moth Suppression and Eradication

Cooperative gypsy moth suppression and eradication projects are planned on about 333,000 acres of State and private lands in eight States in 1996 (table 7). This is about 16 percent more acreage than in 1995. Larger treatment projects are planned in New Jersey, Ohio, Pennsylvania, West Virginia, and Wisconsin this year compared with those in 1995. Delaware and Michigan will have projects similar in size to last year's, while Maryland's will be smaller. Modest gypsy moth suppression projects are planned on about 1192 acres of National Park Service and Fish and Wildlife Service lands this year (table 9). No gypsy moth suppression projects are planned on National Forest lands in 1996. Forest Service contributions to the costs of gypsy moth suppression and eradication projects on Federal, State, and private lands are estimated to be about $4.5 million. Treatments will include use of *B.t.k.*, diflubenzuron, gypsy moth virus (Gypchek), and mating disruption (pheromone flakes).

Native Defoliators and Pathogens

The Northeastern Area plans to cooperate with the Commonwealth of Pennsylvania in 1996 to treat about 61,000 acres with *B.t.k.* to prevent damage to forest resources from forest tent caterpillar and fall cankerworm (table 8). It was anticipated that upwards of 50,000 acres in the Allegheny National Forest would need to be treated in 1996 to protect forest resources from cherry scallop shell moth. Evaluation of populations of a wasp that parasitizes the eggs of the cherry scallop shell moth were conducted during the year. Though parasitism is difficult to assess before summer, preliminary estimates are that cherry scallop shell moth populations will collapse in 1996 and should not pose a threat to forest resources.

The cooperative oak wilt control program will continue in Minnesota during 1996 with the expected treatment of about 500 infection centers and removal of an additional 2000 infected trees (table 8). Fort McCoy in Wisconsin plans to treat about 250 oak wilt infection centers on 7500 acres in 1996 (table 9).

The Northeastern Area also plans to provide technical and financial assistance to the National Park Service to protect trees on Ellis and Liberty Islands National Historic Site from defoliation caused by sycamore anthracnose (table 9).

Hemlock Woolly Adelgid

The first hemlock woolly adelgid (HWA) review meeting was held earlier this fiscal year in Charlottesville, Virginia, to bring together State and Federal pest managers, researchers and practitioners to exchange

information. A video about HWA is completed, and a public affairs plan has been created to raise awareness. A meeting in Blacksburg, Virginia, in March 1996 helped refine high priority needs as evaluating hemlock health impacts of HWA, and biological control research. Biological control research will intensify to evaluate Japanese predators and to survey Chinese forests for additional predator species to evaluate. HWA cold hardiness will be further evaluated to provide information on the limits of northward spread. Impact plots will provide an additional year of data to determine tree impacts in New Jersey, Pennsylvania, and West Virginia.

Gypsy Moth Slow the Spread Pilot Project

Treatments are planned on about 35,000 acres of public and private lands in North Carolina, Virginia, West Virginia and the Jefferson National Forest in Virginia. Treatment of 95 acres using mass trapping is proposed for the first time in the slow the spread (STS) project area in the Upper Peninsula of Michigan.

The economic analysis of STS pilot project by our Clemson University cooperator is continuing in 1996. STS pilot project cost data for 1994 and 1995 will be analyzed and used to refine the projected costs and benefits of implementing the STS strategy throughout the transition area.

A communications plan for STS will be prepared in 1996.

Project Safety

Northeastern Area emphasis in the field during 1996 will continue to be oriented towards ground support personnel and equipment, vehicle maintenance and operation, as well as continuing established aviation management and safety guidance. Also, technical assistance will be provided as needed to cooperators who are using DGPS for the first time. As many operational field sites as possible will be visited during the 1996 field season.

An Area-wide survey of training needs will be conducted, especially in the area of new employees and the need to repeat basic courses. A representative from Northeastern Area headquarters and each of the three field offices attended the Forest Health Protection sponsored workshop "Natural Resource Aerial Survey Aviation Safety Management" held in Denver, Colorado, in April 1996. The four Northeastern Area representatives will work together this year to bring this workshop to the Northeastern Area in spring 1997.

The Northeastern Area, Forest Health Protection, will continue to facilitate the use of National Interagency Radio System Cache (NIRSC) radios for field operations, and continue to assist State agencies in obtaining personal protective equipment for project personnel.

More emphasis will be placed on initiating the Aviation SAFECOM Report, an informational standardized report identifying aircraft incidents and accidents. The data from this report will be used as a trend analysis tool to identify patterns and eventually to produce an annual briefing paper for cooperators. The final product from a given year's activities will provide operational information at the annual gypsy moth cooperators meeting.

Gypsy Moth Decision Support System

A number of enhancements are planned to begin in 1996 including these: addition of a graphical depiction of the relationship between spray deposit and insect mortality, comparison of aircraft flight lines in a spray block to the insecticide deposit predicted by the spray model, and the capability to identify sensitive areas near treatment blocks and the production of no spray buffer zones.

Pending users who will begin receiving GypsES in 1996 are the Ohio Department of Agriculture, Indiana Department of Natural Resources, Orange and Fairfax counties (Virginia), Wayne National Forest (Ohio), and Monongahela National Forest (West Virginia).

National Pest Suppression Tracking System

The Washington Office Forest Health Protection staff has asked the Northeastern Area's Morgantown Field Office to implement the National Pest Suppression Tracking System again in 1996. The system provides the Chief of the Forest Service and other interested individuals with daily updates of all Forest Service forest pest suppression and eradication projects nationwide, including the number of acres treated, insecticides used, and a brief summary of each day's spray activity.

National Gypsy Moth Environmental Impact Statement

The Deputy Chief of the Forest Service and the Deputy Administrator of APHIS signed the Record of Decision (ROD) on January 16, 1996. The Deputies selected alternative 6, which includes all three of the gypsy moth management strategies—suppression, eradication, and slow the spread—analyzed in the environmental impact statement (EIS). The ROD was announced in the *Federal Register* on February 15, 1996. A copy of the ROD has been placed on the APHIS Homepage and can be viewed or downloaded at this internet address: **http//www.aphis.usda.gov/bbep/ead/ppqdocs.html** (look for Gypsy Moth Programs, and click on Record of Decision, Gypsy Moth Management in the United States: a cooperative approach).

Site-specific environmental analyses for gypsy moth suppression and eradication projects in 1996 are being prepared under the umbrella of the new EIS. To help facilitate its use the Forest Service and APHIS prepared a general outline for cooperators to use in preparing their 1996 environmental assessments. Later this year Forest Service and APHIS personnel will review the environmental assessments and fine tune the outline for 1997.

Treatment Monitoring Program

The evaluation of gypsy moth suppression projects that was initiated in 1995 will continue in 1996. Emphasis will be placed on encouraging all cooperators to collect and report complete datasets of the information necessary for evaluation of project success. Final reports for 1996 suppression projects will be completed by March 1, 1997 or earlier so that there is sufficient time to implement any recommendations in the report before the next spray season begins. Beginning with the 1996 supression project reports the Northeastern Area will emphasize project success according to the number of acres on which the project objectives were successfully realized, rather than the total number of acres treated.

Full implementation of this treatment monitoring program will be worked out with cooperators at the gypsy moth suppression and eradication projects review meeting in summer.

Cooperative Suppression and Eradication
1994 Accomplishments

Table 1. *Gypsy moth suppression and eradication activities on State and private lands in 1994.*

State	Acres Treated	Expenditures			Insecticide(s) Used
		Cooperator	Federal	Total	
		(Acres and dollars in thousands)			
Delaware	33	$185	$185	$370	*B.t.k.*/DFB
Maryland	96	1637	1452[1]	3089	*B.t.k.*/DFB
Michigan	143	1522	1481	3003	*B.t.k.*
New Jersey	4	159	147	306	*B.t.k.*
Ohio	6	123	111	234	*B.t.k.*/DFB/NPV
Pennsylvania	86	1461	790	2251	*B.t.k.*/DFB
West Virginia	103	888	670	1558	*B.t.k.*/DFB
Wisconsin[2]	51	622	794	1416	*B.t.k*
Total	**522**	**$6597**	**$5630**	**$12227**	

[1] Includes expenditures to treat 166 acres at Indianhead Naval Depot, see table 3.

[2] Eradication project

Insecticides: *B.t.k.* = *Bacillus thuringiensis* var. *kurstaki*
DFB = diflubenzuron
NPV = nucleopolyhedrosis virus (Gypchek)

Table 2. *Oak wilt (OW) suppression activities on State and private lands in 1994.*

State	Pest	Centers Treated	Expenditures		
			Cooperator	Federal	Total
			(Dollars in thousands)		
Minnesota	OW	740[1]	$563	$494	$1057

[1] Infection centers

Table 3. *Pest Suppression on Federal lands in 1994.*

Site	Location	Pest	Acres Treated	Expenditures
		National Forests		
Allegheny NF	PA	GM	9366	$260,654
Allegheny NF	PA	ESW	55762	537,839
Huron-Manistee NF	MI	GM	915	42,234
Monongahela NF	WV	GM	7648	172,568
		Department of the Interior		
Blackwater NWR	MD	GM	1842	$25,376
Ellis and Liberty Islands NHS	NJ	AN	_	2,000
		Department of Defense		
Indianhead ND	MD	GM	166	**
		Tribal Lands		
Seneca Nation	NY	GM	2419	$56,507
Seneca Nation	NY	ESW	1388	17,614
Total			**74,506**	**$1,114,792**

Sites: ND = Naval Depot
NF = National Forest
NHS = National Historic Site
NWR = National Wildlife Refuge

** included in expenditures for Maryland, see table 1.

Pests: AN = Anthracnose
ESW = Elm Spanworm
GM = Gypsy Moth

Table 4. *Gypsy moth suppression and eradication activities on State and private lands in 1995.*

State	Acres Treated	Expenditures[1] Cooperator	Federal	Total	Insecticide(s) Used
		(Acres and dollars in thousands)			
Delaware	41	$284	$284	$568	*B.t.k.*/DFB/NPV
Maryland	64	1293	1147	2440	*B.t.k.*/DFB
Michigan	86	783	801	1584	*B.t.k.*
New Jersey	8	185	185	370	*B.t.k.*
Ohio	7	115	191	306	*B.t.k.*
Pennsylvania	9	285	247	532	*B.t.k.*
West Virginia	51	632	475	1107	*B.t.k.*/DFB/NPV
Wisconsin[2]	21	490	632	1122	*B.t.k*
Total	**287**	**$4067**	**$3962**	**$8029**	

[1] estimates
[2] eradication project

Insecticides: *B.t.k.* = *Bacillus thuringiensis* var. *kurstaki*
DFB = diflubenzuron
NPV = nucleopolyhedrosis virus (Gypchek)

Table 5. *Other suppression activities on State and private lands in 1995.*

State	Pest	Treatments	Expenditures[1] Cooperator	Federal	Total	Insecticide(s) Used
Minnesota	OW	776[2]	$500	$500	$1000	
Pennsylvania	FTC	28[3]	976	325	1301	*B.t.k.*
Total			**$1476**	**$825**	**$2301**	

[1] Estimate in thousands of dollars
[2] Infection centers treated
[3] Thousands of acres

Pests: FTC = Forest Tent Caterpillar
OW = Oak Wilt

B.t.k. = *Bacillus thuringiensis* var. *kurstaki*

Federal Lands Suppression
1995 Accomplishments

Table 6. *Pest suppression on Federal lands in 1995.*

Site	Location	Pest	Acres Treated	Expenditures
		National Forests		
Allegheny NF	PA	FTC	55,444	$406,113
Monongahela NF	WV	GM	15,171	376,328
		Department of Defense		
Fort McCoy	WI	OW	288[1]	25,915
Indianhead ND	MD	GM	974	35,000
		Department of the Interior		
Blackwater NWR	MD	GM	2860	$45,038
Delaware Water Gap NRA	PA	HWA	_	3,686
		Tribal Lands		
Grand Portage IR	MN	ESB	178	$9,000
Seneca Nation	NY	GM	123	1,704
Seneca Nation	NY	FTC/FCW	2353	16,296
		Miscellaneous Federal		
Beltsville Agricultural Research Center (USDA)	MD	GM	339	$5,575
Smithsonian Environmental Education Center	MD	GM	15	120
Total			**77,657**	**$924,775**

[1]Infection centers

Sites: ND = Naval Depot
NF = National Forest
NRA = National Recreation Area
NWR = National Wildlife Refuge
IR = Indian Reservation

Pests: ESB = Eastern Spruce Budworm
FCW = Fall Cankerworm
FTC = Forest Tent Caterpillar
GM = Gypsy Moth
HWA = Hemlock Woolly Adelgid
OW = Oak Wilt Disease

Cooperative Suppression and Eradication
1996 Projects (Proposed)

Table 7. *Proposed gypsy moth suppression and eradication activities on State and private lands in 1996.*

State	Acres Proposed	Projected Expenditures Cooperator	Federal	Total	Insecticide(s)
		(Acres and dollars in thousands)			
Delaware	37	$317	$316	$633	*B.t.k.*/DFB
Maryland	41	1430	1147	2577	*B.t.k.*/DFB
Michigan	87	881	887	1758	*B.t.k.*
New Jersey	21	299	291	590	*B.t.k.*
Ohio	23	214	211	425	*B.t.k.*/DFB
Pennsylvania	25	243	204	447	*B.t.k.*
West Virginia	67	967	729	1696	*B.t.k.*/DFB/NPV
Wisconsin[1]	32[2]	637	714	1351	*B.t.k*/MD
Total	**333**	**$4988**	**$4499**	**$9477**	

[1] Eradication project
[2] Includes treatments on Nicolet NF (160 acres) and Oneida Indian Reservation (6005 acres).

Insecticides: *B.t.k.* = *Bacillus thuringiensis* var. *kurstaki*
DFB = diflubenzuron
MD = mating disruption
NPV = nucleopolyhedrosis virus (Gypchek)

Table 8. *Proposed suppression activities of other pests on State and private lands in 1996.*

State	Proposed Treatments	Pest	Estimated Expenditures[1] Cooperator	Federal	Total	Insecticide
Minnesota	500[2]	OW	$400	$125	$525	
Pennsylvania	61[3]	FTC	820	261	1081	*B.t.k.*
Total			**$1220**	**$386**	**$1606**	

[1] Thousands of dollars
[2] Infection centers treated
[3] Thousands of acres

Pests: FTC = Forest Tent Caterpillar
OW = Oak Wilt

B.t.k. = *Bacillus thuringiensis* var. *kurstaki*

Federal Lands Suppression
1996 Projects (Proposed)

Table 9. *Proposed pest suppression on Federal lands in 1996.*

Site	Location	Pest	Acres Proposed	Estimated Cost
		Department of the Interior		
Blackwater NWR	MD	GM	1022	$40,000
Gettysburg NB	PA	HWA	-	3,000
Morristown NHP	NJ	HWA	-	3,000
Piscatawny Park	MD	GM	100	30,000
Ellis and Liberty Islands NHS	NJ	AN	-	3,000
Sagamore Hill NHS	WV	GM	70	6,000
		Department of Defense		
Fort McCoy	WI	OW	•[1]	$33,000
Total			**1192**	**$85,000**

[1] 250 infection centers on 7500 acres

Sites: NB = National Battlefield
NHP = National Historical Park
NHS = National Historic Site
NWR = National Wildlife Refuge

Pests: AN = Anthracnose
GM = Gypsy Moth
HWA = Hemlock Woolly Adelgid
OW = Oak Wilt